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Publications of the Space Physiology and Countermeasures Program, Cardiopulmonary Discipline: 1980-1990

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PREFACE

This bibliography contains publications resulting from research supported by the Cardiopulmonary Discipline of the NASA Space Physiology and Countermeasures Program during the years 1980-1990. It is one of a series of four bibliographies being published in 1992 of the disciplines of the Space Physiology and Countermeasures Program. Others in this series include publications from the Regulatory Physiology, Musculoskeletal, and Neuroscience Disciplines. Portions of this compilation have been published previously as part of a series of bibliographies of space biomedical research. Previous editions in this series cover the years 1980-1982 (NASA CR-3587), 1982-1983 (NASA CR-3739), 1983-1984 (NASA CR-3860), 1984-1986 (NASA CR-4184), and 1987-1988 (NASA CR-187840).

This bibliography is divided into sections: Fluid Shifts, Cardiovascular Fitness and Exercise, Cardiovascular Physiology, Pulmonary Physiology, and General Physiology. The Fluid Shifts section is concerned with the effects of the headward fluid shift, which occurs in weightlessness, on cardiovascular function, kidney function, and the renin-angiotensin system. (Other fluid and electrolyte references can be found in *Publications of the Space Physiology and Countermeasures Program, Regulatory Physiology Discipline: 1980-1990*, NASA CR-4469.) The Cardiovascular Fitness and Exercise section incorporates studies of cardiovascular fitness, exercise dynamics, and the correlation of differences in fitness levels and cardiovascular changes. The Cardiovascular Physiology section includes references on general cardiovascular functioning or references that incorporate elements of more than one of the previous sections. The Pulmonary Physiology section involves studies of the pulmonary system, including lung function and gas exchange. The last section, General Physiology, is included to provide the reader with additional, background material in space physiology research. NASA-funded investigators whose work resulted in these publications are identified by an asterisk. A principal investigator index of researchers conducting Cardiopulmonary investigations, as well as a list of Cardiopulmonary investigators and their affiliations, are also included in the bibliography.

As part of our continuing interaction with the scientific and professional community, we are pleased to present this bibliography in an effort to stimulate an exchange of information and ideas among scientists working in this discipline. I would like to thank April Commodore Roy and Audrey Robin Brown for their technical assistance in the production of this bibliography.

Janis H. Stoklosa, Ph.D.
Manager, Space Physiology and Countermeasures Program

INTRODUCTION

The Cardiopulmonary Discipline is part of the Space Physiology and Countermeasures Program of the NASA Life Sciences Division. Space life sciences research was initiated in 1960 with the goal of enabling human survival in space. Now, in the late 20th century, the program is evolving to ensure human health and productivity on space missions: on the space shuttle in the 1990s, then on Space Station Freedom, and ultimately on the Moon and missions to Mars.

The goals of the Cardiopulmonary Discipline are to understand the acute and long-term cardiovascular and pulmonary adaptation to space and readaptation to a gravity environment, including the associated mechanisms, and to develop physiological countermeasures to ensure crew health in space and on return to Earth. The Cardiopulmonary research program is comprised of two subdisciplines: Cardiovascular and Pulmonary. This multidisciplinary effort incorporates basic, applied, and operational research, both ground-based and in-flight. Research, conducted at NASA centers and in universities, includes human and animal (rats and non-human primates) subjects.

The Cardiovascular subdiscipline is concerned with the nature, time course, and sequence of cardiovascular adjustments to spaceflight. It also seeks to determine the most effective countermeasures (e.g., lower body negative pressure, fluid rehydration, pharmacology, centrifugation, exercise and/or anti-g devices) to combat adverse cardiovascular effects and when and how they should be applied. Other areas of interest include orthostatic hypotension, cardiovascular responses to extravehicular activity (EVA), and the relationship between the cardiovascular adjustments to spaceflight and those occurring in Earth-based models such as bedrest, immersion, and head-down tilt.

The Pulmonary subdiscipline includes the study of the effects of the space environment on lung function. Specific areas of interest include lung volume, ventilation and blood flow, changes in respiratory muscle structure and function, gas exchange, and the penetration by aerosol particles in the lung. It is also concerned with the relationship between the pulmonary adjustments to spaceflight and those occurring in Earth-based models such as bedrest, immersion, and head-down tilt.

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It includes a detailed description of the experimental procedures and the statistical analysis performed.

3. The third part of the document presents the results of the study. It includes a series of tables and graphs that illustrate the findings of the research. The data shows a clear trend of increasing activity over time.

4. The fourth part of the document discusses the implications of the findings. It suggests that the results have significant implications for the field of study and may lead to further research in this area.

5. The fifth part of the document concludes the study. It summarizes the key findings and provides a final statement on the importance of the research.

6. The sixth part of the document provides a detailed description of the experimental setup. It includes a list of the equipment used and a description of the procedures followed during the experiment.

7. The seventh part of the document discusses the limitations of the study. It acknowledges that there are certain factors that may have influenced the results and that further research is needed to confirm the findings.

8. The eighth part of the document provides a list of references. It includes a series of citations to other works in the field, which provide context for the current study.

9. The ninth part of the document includes a list of figures and tables. It provides a brief description of each figure and table, indicating the data it represents.

10. The tenth part of the document includes a list of appendices. It provides a brief description of each appendix, indicating the additional information it contains.

11. The eleventh part of the document includes a list of footnotes. It provides additional information on certain points mentioned in the text, which may not have fit into the main body of the document.

12. The twelfth part of the document includes a list of acknowledgments. It expresses gratitude to the individuals and organizations that provided support and assistance during the course of the study.

13. The thirteenth part of the document includes a list of declarations. It states that the author has no conflicts of interest and that the work was completed independently.

14. The fourteenth part of the document includes a list of contact information. It provides the author's name, address, and contact details for further inquiries.

15. The fifteenth part of the document includes a list of keywords. It identifies the key terms used in the study, which will help in searching for related works.

16. The sixteenth part of the document includes a list of references. It provides a series of citations to other works in the field, which provide context for the current study.

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FLUID SHIFTS

Aratow, M.; Coutts, R.D.; Mai, M.T.; Blevins, F.T.; Crenshaw, A.; Hargens*, A.R.
The effect of continuous passive motion on muscle compartment pressure and femoral vein flow in the lower extremity (Abstract).

Transactions of the Annual Meeting, Orthopaedic Research Society 14: 573, 1989. (GWU 6732)

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